SPECIFICATION
FOR
APPROVAL

MODEL : 21.5” TFT-LCD Module with Projected Capacitive touch sensor
TP2A-Y215N07

BASE MODEL :

[Customer's Confirmation]

Approved by:

Reviewed by:

Prepared by:

[Supplier's Confirmation]

元眾實業有限公司

Y.J.E. Display Tech. Co.,Ltd.

Approved by:

Reviewed by:

Prepared by:

Contents

Record of Revision

Version & Date	Page	Old Description	New Description
2016/03/09	All	First Edition for Customer	

1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
6) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.
7) Do not open nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT Module may be damaged.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) Please pay attention for the matter as stated below at mounting design of the TFT module with Touch Sensor & enclosure:
    - After installation of the TFT Module with Touch Sensor into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module with Touch Sensor even momentary. At designing the enclosure, it should betaken into consideration that no bending/twisting forces are applied to the TFT Module with Touch Sensor from outside. Otherwise the TFT Module with Touch Sensor may be damaged.
    - Enclosure support to fix TFT Module with Touch Sensor must be out of view (transparent) area.(Do not design enclosure presses the view area to protect from miss input)
    - Enclosure edge must be between view area & Guaranteed active area. (Enclosure edge must not touch with view area)
    - We recommend the material of support to fix touch sensor is elastic material.
    - Do not bond top surface (film) of touch sensor with enclosure.
    - The corner parts have conductivity. Do not touch any metal part after mounting.
    - Special design is required for water resistance use.
    - Cleaning Touch panel by Air gun, pressure 2kg/cm2 below is suggested. This is preventing FPC to peel off when air is blowing to FPC from glass side.
    - The mounting structure must has a reserved space for the FPC tail and never touch or squeeze the FPC by case or another components preventing FPC to peel off.
12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time.
14) Continuous operating TFT-LCD display under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
16) Continuous displaying fixed pattern may induce image sticking. It is recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.
17) Do not lift Touch Panel by cable(FPC).

2. General Description

• This specification applies to the 21.5 inch-wide Color a-Si TFT-LCD module with Projected Capacitive touch sensor.
• The screen format is intended to support HD (1920(H) X 1080(V)) screen and 16.7M colors (8 bits RGB data input).
• All input signals are LVDS interface compatible.
• LED Driver is embedded.
• This is a RoHS product.

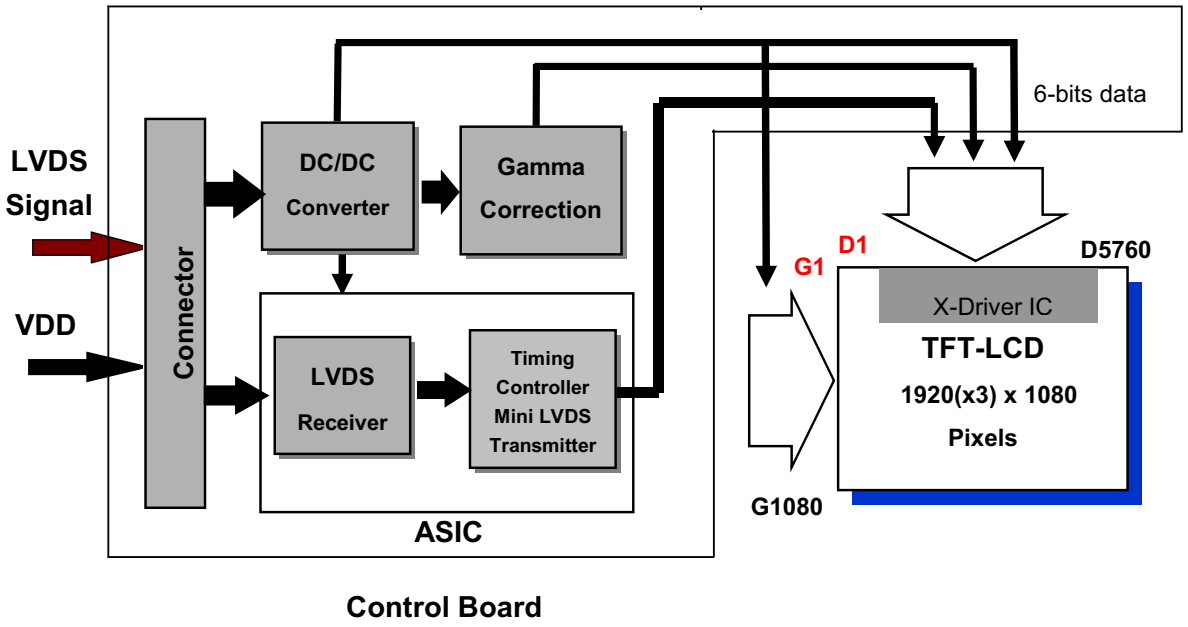
Display Characteristics

The following items are characteristics summary on the table under 25°C condition:

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	546.86 (21.53")
Active Area	[mm]	476.64 (H) x 268.11 (V)
Pixels H x V	-	1920(x3) x 1080
Pixel Pitch	[um]	248.25 (per one triad) ×248.25
Pixel Arrangement	-	R.G.B. Vertical Stripe
Display Mode	-	VA Mode, Normally Black
White Luminance (Center)	[cd/m^2]	213 (Typ.)
Contrast Ratio	-	3000 (Typ.)
Response Time	[msec]	18ms (Typ., on/off)
Power Consumption (LCD Module + Backligh unit)	[Watt]	15.2 (Typ.) LCD module : PDD (Typ.)= 3.1 @ all white pattern,Fv=60Hz Backlight unit : P_{BLU} (Typ.) =12.1 @Is=65mA
Weight	[Grams]	1670
Outline Dimension	[mm]	495.6(H) × 292.2(V) × 10.6(D) Typ.
Electrical Interface	-	Dual channel LVDS , 8 bits RGB data input
Support Color	-	16.7M colors
Surface Treatment	-	Anti-Glare, 3H
Temperature Range Operating Storage (Shipping)	 [°C] [°C]	 0 to +50 -20 to +60
RoHS Compliance	-	RoHS Compliance
TCO Compliance	-	TCO 6.0 Compliance

3. Functional Block Diagram

The following diagram shows the functional block of the 21.5 inches Color TFT-LCD Module:



4. Absolute Maximum Ratings

Absolute Ratings

Symbol	Description	Min	Max	Unit	Remark
VDD	Power Supply Input Voltage	GND-0.3	6.0	[Volt]	Ta=25℃

Absolute Ratings of Environment

Symbol	Description	Min.	Max.	Unit
TOP	Operating Temperature	0	+50	[°C]
TGS	Glass surface temperature (operation)	0	+65	[°C]
HOP	Operation Humidity	5	90	[%RH]
TST	Storage Temperature	-20	+60	[°C]
HST	Storage Humidity	5	90	[%RH]

5. Optical Characteristics

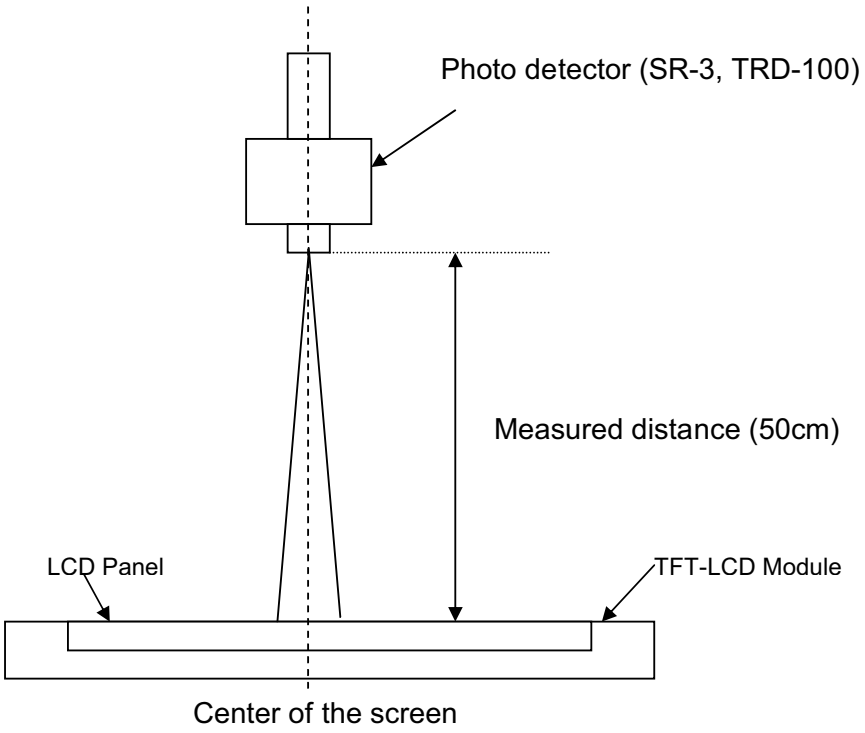
The optical characteristics are measured on the following test condition.

Test Condition:

VDD=5.0V, Fv=60Hz,Is=65mA,Ta=25 ℃

Symbol	Description		Min.	Typ.	Max.	Unit
L_w	White Luminance (Center of screen)		-	213	-	[cd/m2]
L_{uni}	Luminance Uniformity (9 points)		75	80	-	[%]
CR	Contrast Ratio (Center of screen)		2000	3000	-	-
θ_R	Horizontal Viewing Angle (CR=10)	Right	75	89	-	[degree]
θ_L		Left	75	89	-	
Φ_H	Vertical Viewing Angle (CR=10)	Up	75	89	-	
Φ_L		Down	75	89	-	
θ_R	Horizontal Viewing Angle (CR=5)	Right	75	89	-	
θ_L		Left	75	89	-	
Φ_H	Vertical Viewing Angle (CR=5)	Up	75	89	-	
Φ_L		Down	75	89	-	
T_R	Response Time	Rising Time	-	13	28	[msec]
T_F		Falling Time	-	5	8	
-		Rising + Falling	-	18	36	
R_x	Color Coordinates (CIE 1931)	Red x	0.622	0.652	0.682	-
R_y		Red y	0.305	0.335	0.365	
G_x		Green x	0.291	0.321	0.351	
G_y		Green y	0.595	0.625	0.655	
B_x		Blue x	0.123	0.153	0.183	
B_y		Blue y	0.037	0.067	0.097	
W_x		White x	0.283	0.313	0.343	
W_y		White y	0.299	0.329	0.359	
NTSC Area Ratio				72		[%]
CT	Crosstalk		-	-	2.0	[%]
F_{dB}	Flicker (Center of screen)		-	-	TBD	[dB]

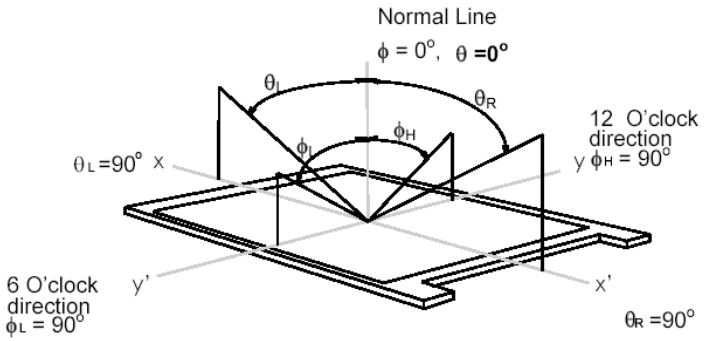
Note 1: Equipment setup :



Note 2: Viewing angle measurement

Definition: The angle at which the contrast ratio is greater than 10 & 5 .

a. Horizontal view angle: Divide to left & right (θ_L & θ_R)
Vertical view angle: Divide to up & down (Φ_H &Φ_L)



Note 3: Contrast Ratio Measurement

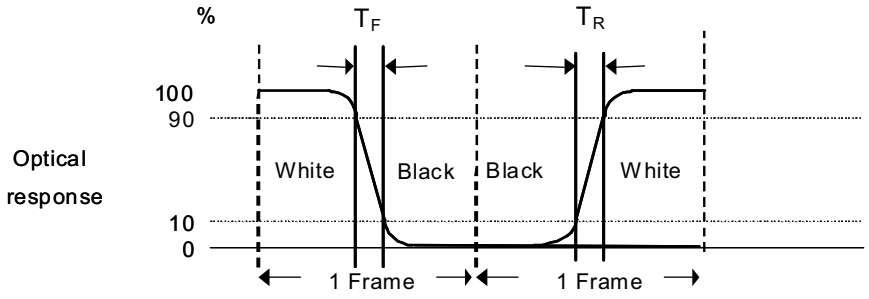
Definition:

$$\text{Contrast Ratio} = \frac{\text{Luminance of White pattern}}{\text{Luminance of Black pattern}}$$

a. Measured position: Center of screen (P5) & perpendicular to the screen (θ=Φ=0°)

Note 4 : Response time measurement

The output signals of photo detector are measured when the input signals are changed from "Black" to "White" (rising time, T_R), and from "White" to "Black" (falling time, T_F), respectively. The response time is interval between the 10% and 90% of optical response. (*Black & White color definition: Please refer section 3.4.3)*

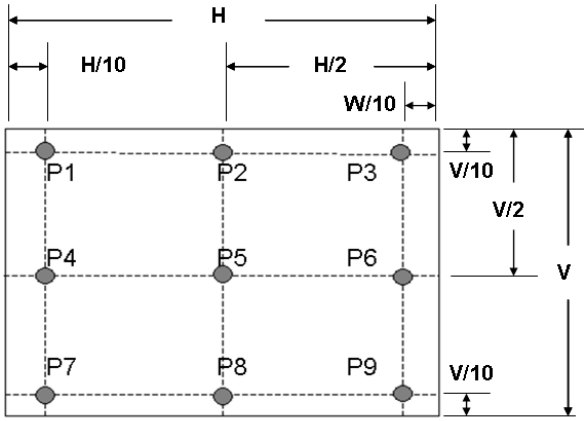


Note 5: Luminance Uniformity Measurement

Definition:

$$\text{Luminance Uniformity} = \frac{\text{Minimum Luminance of 9 Points (P1 ~ P9)}}{\text{Maximum Luminance of 9 Points (P1 ~ P9)}}$$

a.Test pattern: White Pattern



Note 6: Crosstalk measurement

Definition:

CT = Max. (CT_H,CT_V);

a.Maximum Horizontal Crosstalk :

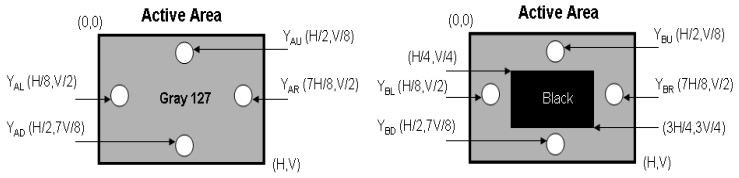
CT_H = Max. (| Y_{BL} – Y_{AL} | / Y_{AL} × 100 %, | Y_{BR} – Y_{AR} | / Y_{AR} × 100 %);

Maximum Vertical Crosstalk:

CT_V = Max. (| Y_{BU} – Y_{AU} | / Y_{AU} × 100 %, | Y_{BD} – Y_{AD} | / Y_{AD} × 100 %);

b. Y_{AU}, Y_{AD}, Y_{AL}, Y_{AR} = Luminance of measured location without Black pattern

Y_{BU}, Y_{BD}, Y_{BL}, Y_{BR} = Luminance of measured location with Black pattern



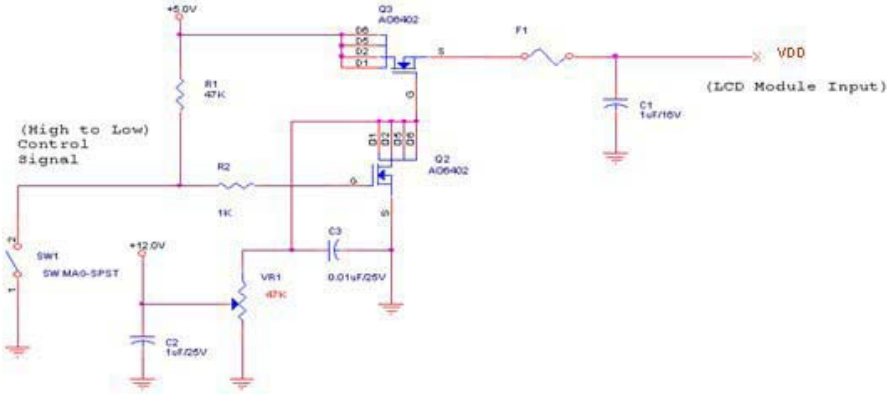
6. Electrical Characteristics

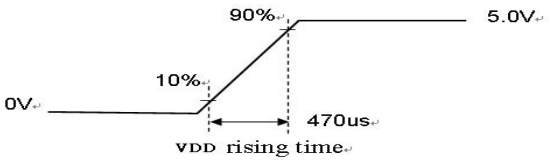
6.1 Power Specification

Symbol	Description	Min	Typ	Max	Unit	Remark
VDD	Power supply Input voltage	4.5	5.0	5.5	[Volt]	
IDD	Power supply Input Current (RMS)	-	0.62	0.74	[A]	VDD= 5.0V, Black Pattern, Fv=60Hz
			0.7	0.84	[A]	VDD= 5.0V, Black Pattern, Fv=75Hz
PDD	VDD Power Consumption	-	3.1	3.7	[Watt]	VDD= 5.0V, Black Pattern, Fv=60Hz
			3.5	4.2	[Watt]	VDD= 5.0V, Black Pattern, Fv=75Hz
IRush	Inrush Current	-	-	3.0	[A]	***Note1***
VDDrp	Allowable VDD Ripple Voltage	-	-	500	[mV]	VDD= 5.0V, Black Pattern, Fv=75Hz

Note1: Inrush Current measurement:

Test circuit:



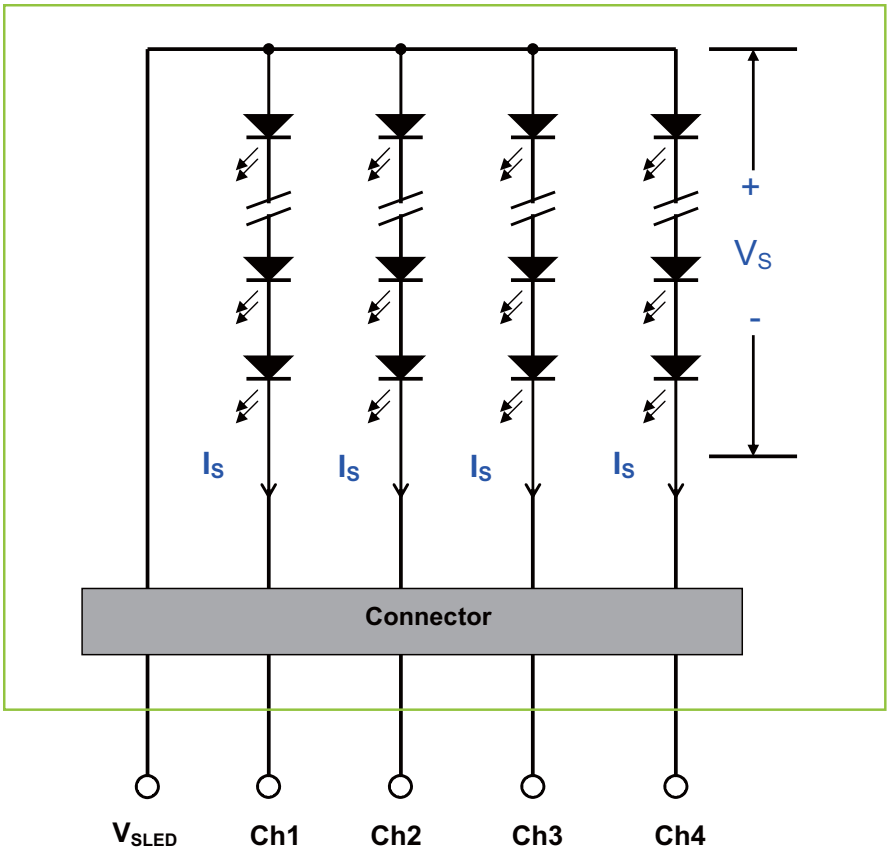


The duration of VDD rising time: 470us.

Backlight Unit

Block Diagram

The following shows the block diagram of the 21.5 inch Backlight Unit. And it includes 60 pcs LED in the LED light bar. (4 strings and 15 pcs LED of one string).

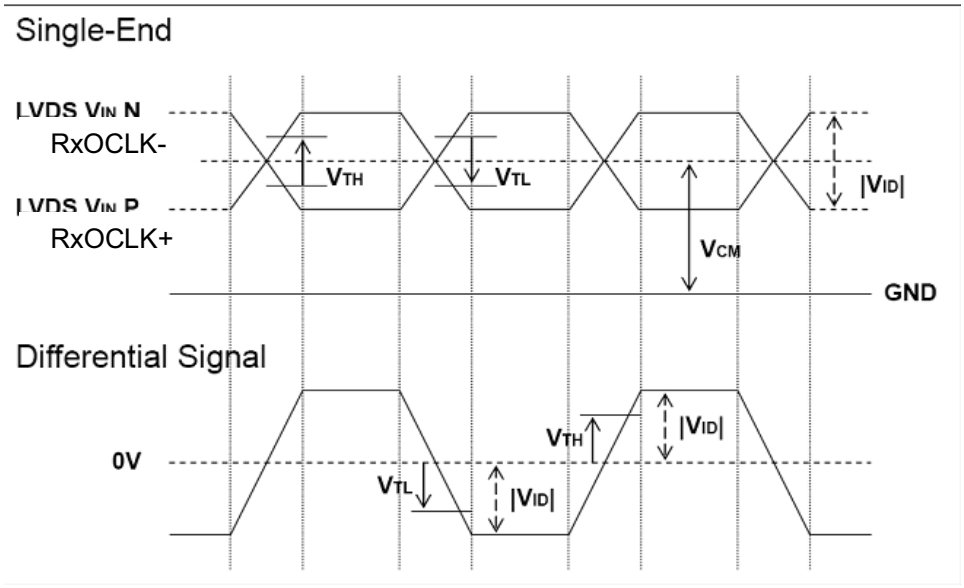


6.2 Signal Electrical Characteristics

Symbol	Description	Min	Typ	Max	Units	Condition
V_{TH}	LVDS Differential Input High Threshold	-	-	+100	[mV]	V_{CM} = 1.2V
V_{TL}	LVDS Differential Input Low Threshold	-100	-	-	[mV]	V_{CM} = 1.2V
$\lvert V_{ID} \rvert$	LVDS Differential Input Voltage	100	-	600	[mV]	
V_{CM}	LVDS Common Mode Voltage	+1.0	+1.2	+1.5	[V]	V_{TH}-V_{TL} = 200mV

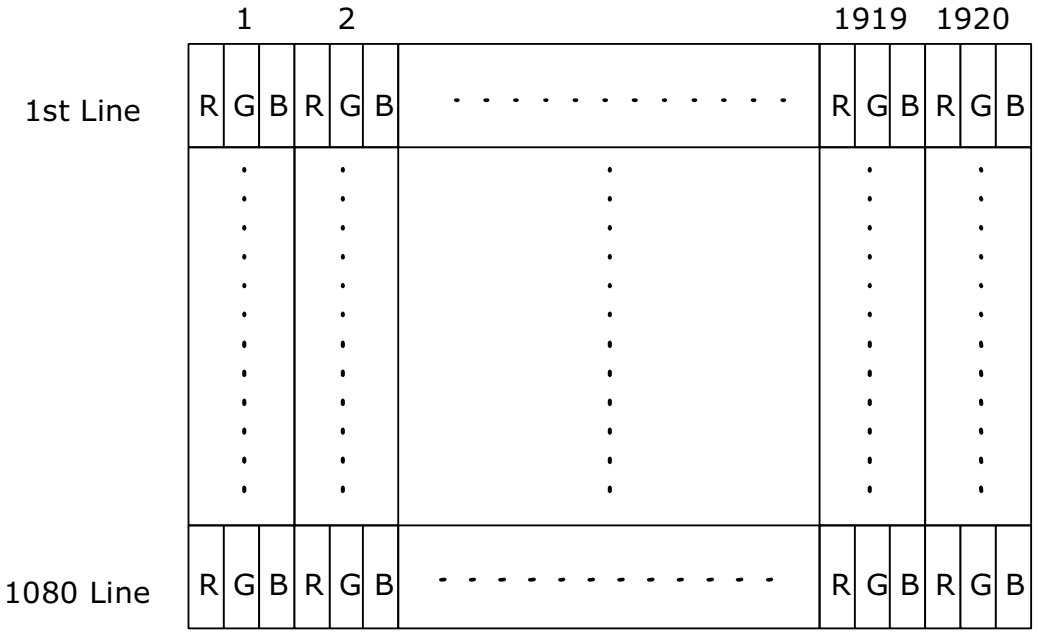
LVDS Signal Waveform:

Use RxOCLK- & RxOCLK+ as example.

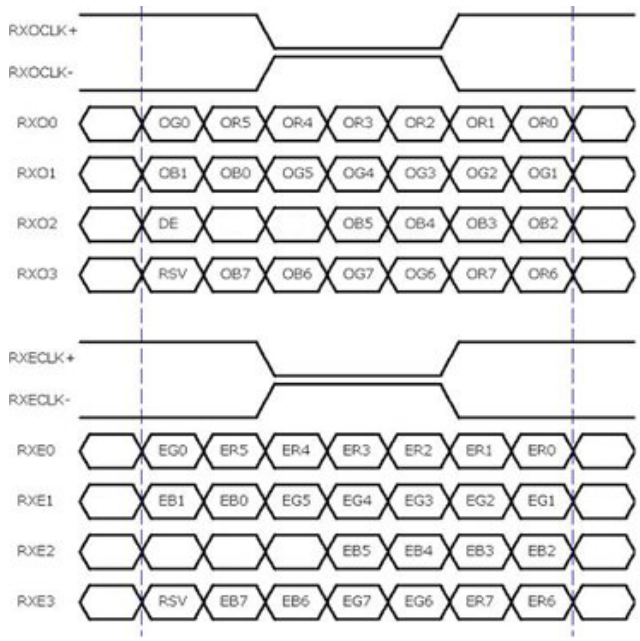


6.3 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.4 The Input Data Format



8 Bit Color Bit Order			
MSB	R7	G7	B7
	R6	G6	B6
	R5	G5	B5
	R4	G4	B4
	R3	G3	B3
	R2	G2	B2
	R1	G1	B1
LSB	R0	G0	B0

6.5 Timing Characteristics

It only support DE mode, and the input timing are shown as the following table.

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
Tv	Vertical Section	Period	1092	1130	1818	Th	
Tdisp (v)		Active	1080	1080	1080	Th	
Tblk (v)		Blanking	12	50	738	Th	
Fv		Frequency	50	60	76	Hz	
Th	Horizontal Section	Period	1034	1050	1100	Tclk	
Tdisp (h)		Active	960	960	960	Tclk	
Tblk (h)		Blanking	74	90	140	Tclk	
Fh		Frequency	55	68	91	KHz	***Note 1***
Tclk	LVDS Clock	Period	10.6	14.0	17.7	ns	1/Fclk
Fclk		Frequency	56.5	71.2	94.0	MHz	***Note 2***

Note 1: The equation is listed as following. Please don't exceed the above recommended value.

Fh (Min.) = Fclk (Min.) / Th (Min.);
Fh (Typ.) = Fclk (Typ.) / Th (Typ.);
Fh (Max.)= Fclk (Max.) / Th (Min.);

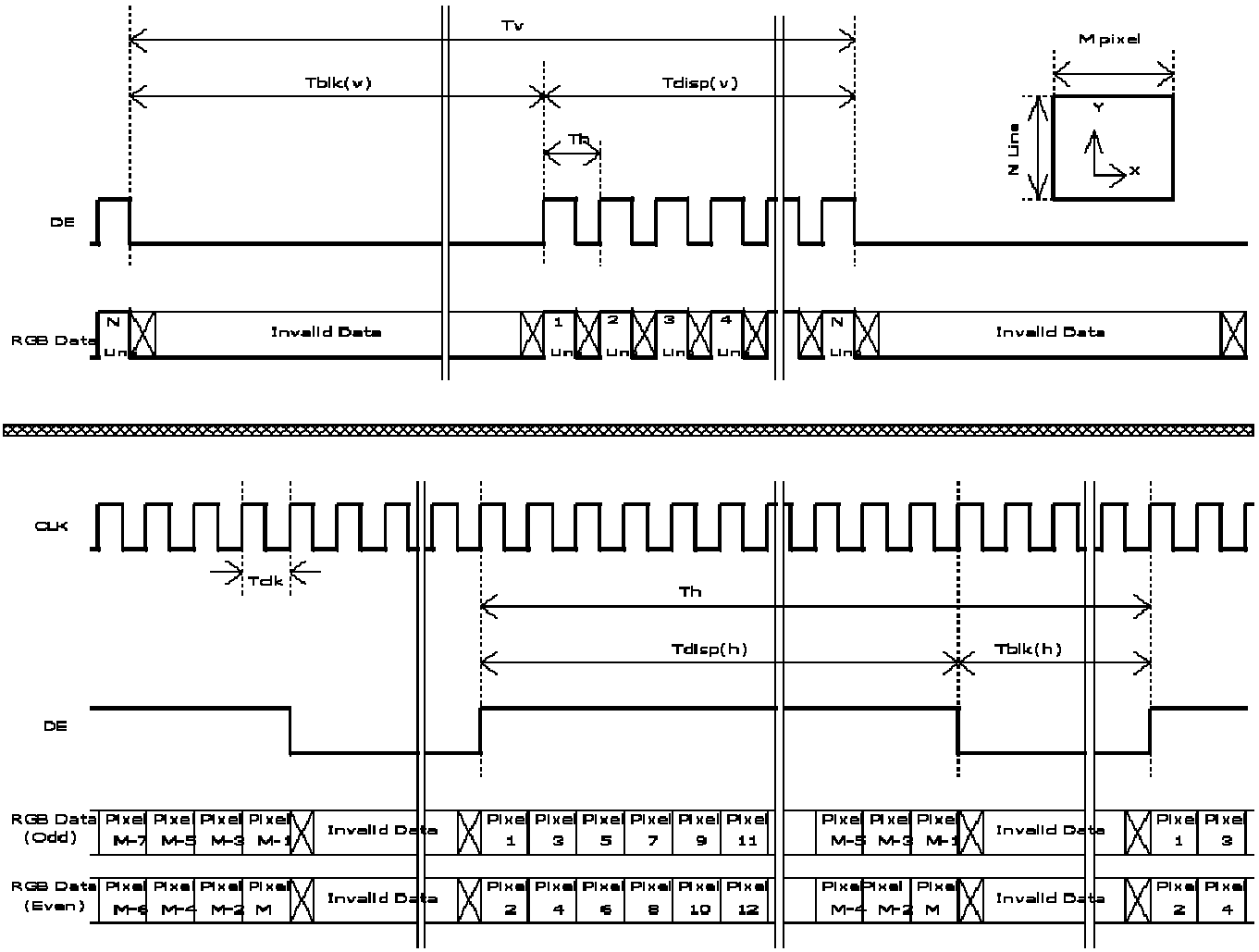
Note 2: The equation is listed as following. Please don't exceed the above recommended value.

Fclk (Min.) = Fv (Min.) x Th (Min.) x Tv (Min.);

Fclk (Typ.) = Fv (Typ.) x Th (Typ.) x Tv (Typ.);

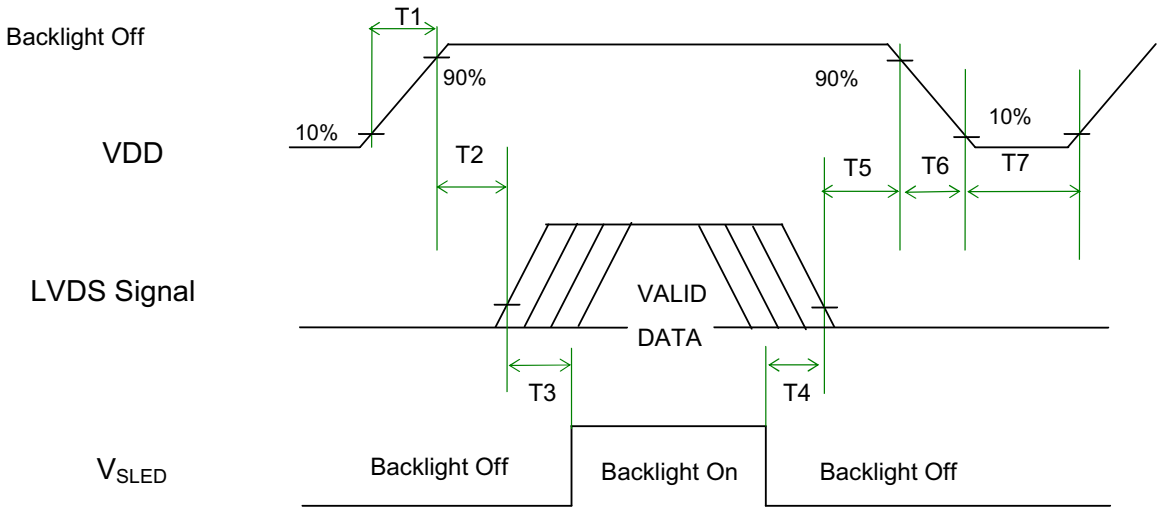
Fclk (Max.) = Fv (Max.) x Th (Typ.) x Tv (Typ.);

6.6 Input Timing Diagram



6.7 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power Sequence Timing

Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
T1	0.5	-	10	[ms]	
T2	0	-	50	[ms]	
T3	500	-	-	[ms]	
T4	100	-	-	[ms]	
T5	0		50	[ms]	***Note 1*** ***Note 2***
T6	0	-	100	[ms]	***Note 1***
T7	1000	-	-	[ms]	

Note 1: Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

Note 2: During T5 and T6 period , please keep the level of input LVDS signals with Hi-Z state.

7. Connector Pin Assignment

Physical interface is described as for the connector on module.These connectors are capable of accommodating the following signals and will be following components.

TFT-LCD Connector	Manufacturer	P-TWO	STM
	Part Number	AL230F-A0G1D-P	MSCKT2407P30HB
Mating Connector	Manufacturer	JAE	
	Part Number	FI-X30HL (Locked Type)	

LVDS Pin Assignment

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

PIN #	Symbol	Description	Remark
1	RxO0-	Negative LVDS differential data input (Odd data)	
2	RxO0+	Positive LVDS differential data input (Odd data)	
3	RxO1-	Negative LVDS differential data input (Odd data)	
4	RxO1+	Positive LVDS differential data input (Odd data)	
5	RxO2-	Negative LVDS differential data input (Odd data)	
6	RxO2+	Positive LVDS differential data input (Odd data)	
7	GND	Ground	
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)	
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)	
10	RxO3-	Negative LVDS differential data input (Odd data)	
11	RxO3+	Positive LVDS differential data input (Odd data)	
12	RxE0-	Negative LVDS differential data input (Even data)	
13	RxE0+	Positive LVDS differential data input (Even data)	
14	GND	Ground	
15	RxE1-	Negative LVDS differential data input (Even data)	
16	RxE1+	Positive LVDS differential data input (Even data)	
17	GND	Ground	
18	RxE2-	Negative LVDS differential data input (Even data)	
19	RxE2+	Positive LVDS differential data input (Even data)	
20	RxECLK-	Negative LVDS differential clock input (Even clock)	
21	RxECLK+	Positive LVDS differential clock input (Even clock)	
22	RxE3-	Negative LVDS differential data input (Even data)	
23	RxE3+	Positive LVDS differential data input (Even data)	
24	GND	Ground	
25	NC	No connection (for AUO test only. Do not connect)	
26	NC	No connection (for AUO test only. Do not connect)	
27	NC	No connection (for AUO test only. Do not connect)	
28	VDD	Power Supply Input Voltage	
29	VDD	Power Supply Input Voltage	
30	VDD	Power Supply Input Voltage	

7.2 Backlight Unit

Backlight Connector	Manufacturer	ENTERY
	Part Number	3707K-S06N-21R
Mating Connector	Manufacturer	ENTERY
	Part Number	H112K-P06N-00B (Non-Locking type) H112K-P06N-03B (Locking type)

Pin#	Symbol	Description	Remark
1	Ch1	LED Current Feedback Terminal (Channel 1)	
2	Ch2	LED Current Feedback Terminal (Channel 2)	
3	V_{SLED}	LED Power Supply Voltage Input Terminal	
4	V_{SLED}	LED Power Supply Voltage Input Terminal	
5	Ch3	LED Current Feedback Terminal (Channel 3)	
6	Ch4	LED Current Feedback Terminal (Channel 4)	

8. Reliability Test

Items	Condition	Remark
Temperature Humidity Bias (THB)	Ta= 50℃, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50℃, 50%RH, 300hours	
Low Temperature Operation (LTO)	Ta= 0℃, 300hours	
High Temperature Storage (HTS)	Ta= 60℃, 300hours	
Low Temperature Storage (LTS)	Ta= -20℃, 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
Thermal Shock Test (TST)	-20℃/30min, 60℃/30min, 100 cycles	***Note 1***
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point.	***Note 2***
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 8 points, 25 times/ point.	
Altitude Test	Operation:18,000 ft Non-Operation:40,000 ft	

Note 1 : a. A cycle of rapid temperature change consists of varying the temperature from -20℃ to 60℃, and back again. Power is not applied during the test.
b. After finish temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2 : EN61000-4-2, ESD class B: Certain performance degradation allowed
No data lost
Self-recoverable
No hardware failures.

9. Safety

● Sharp Edge Requirements

There will be on sharp edges or comers on the display assembly that could cause injury.

-Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.
The printed circuit board will be made from material rated 94-V1 or better.
The actual UL flammability rating will be printed on the printed circuit board.

● Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

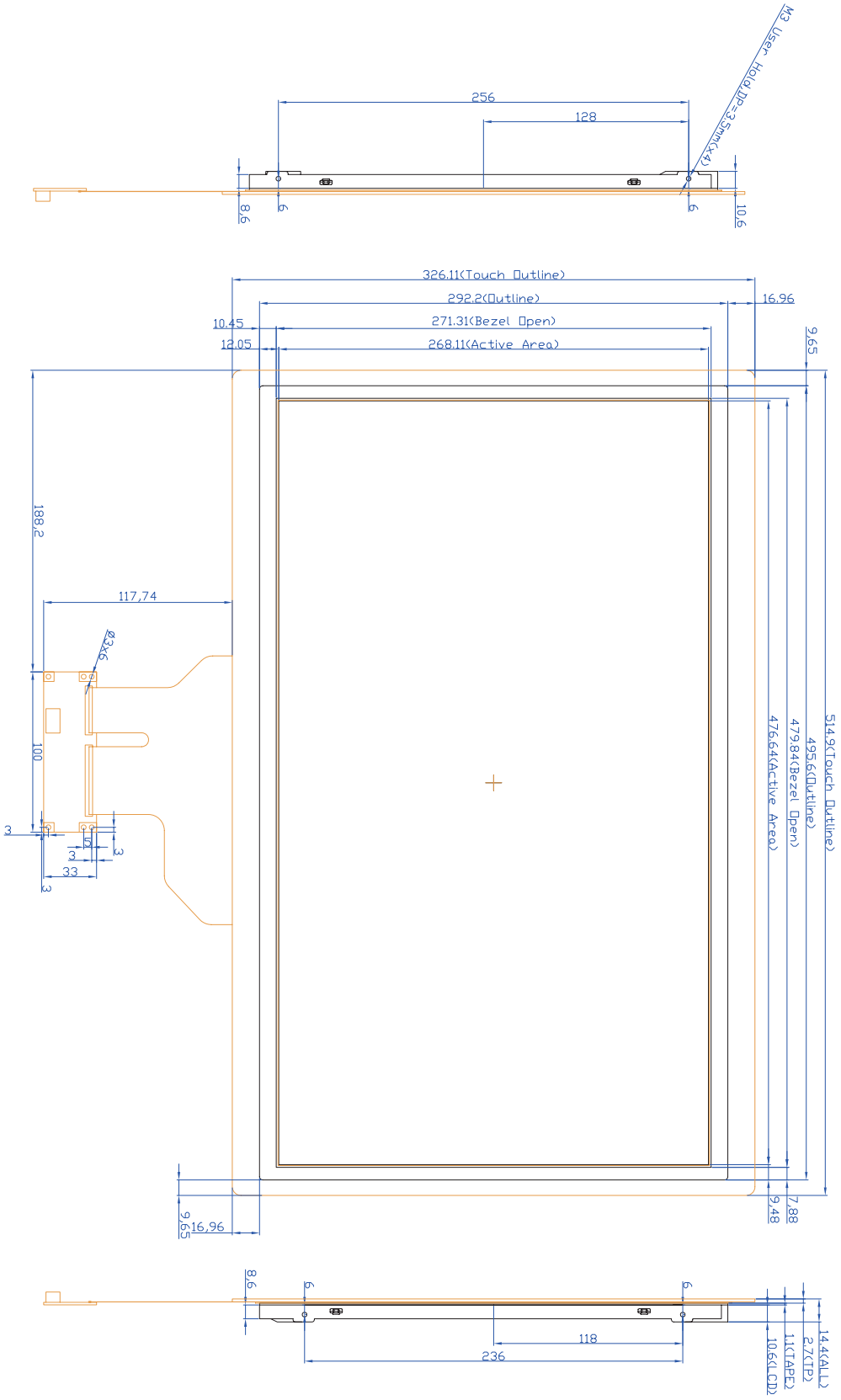
10. Mechanical Characteristics

The contects provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD.

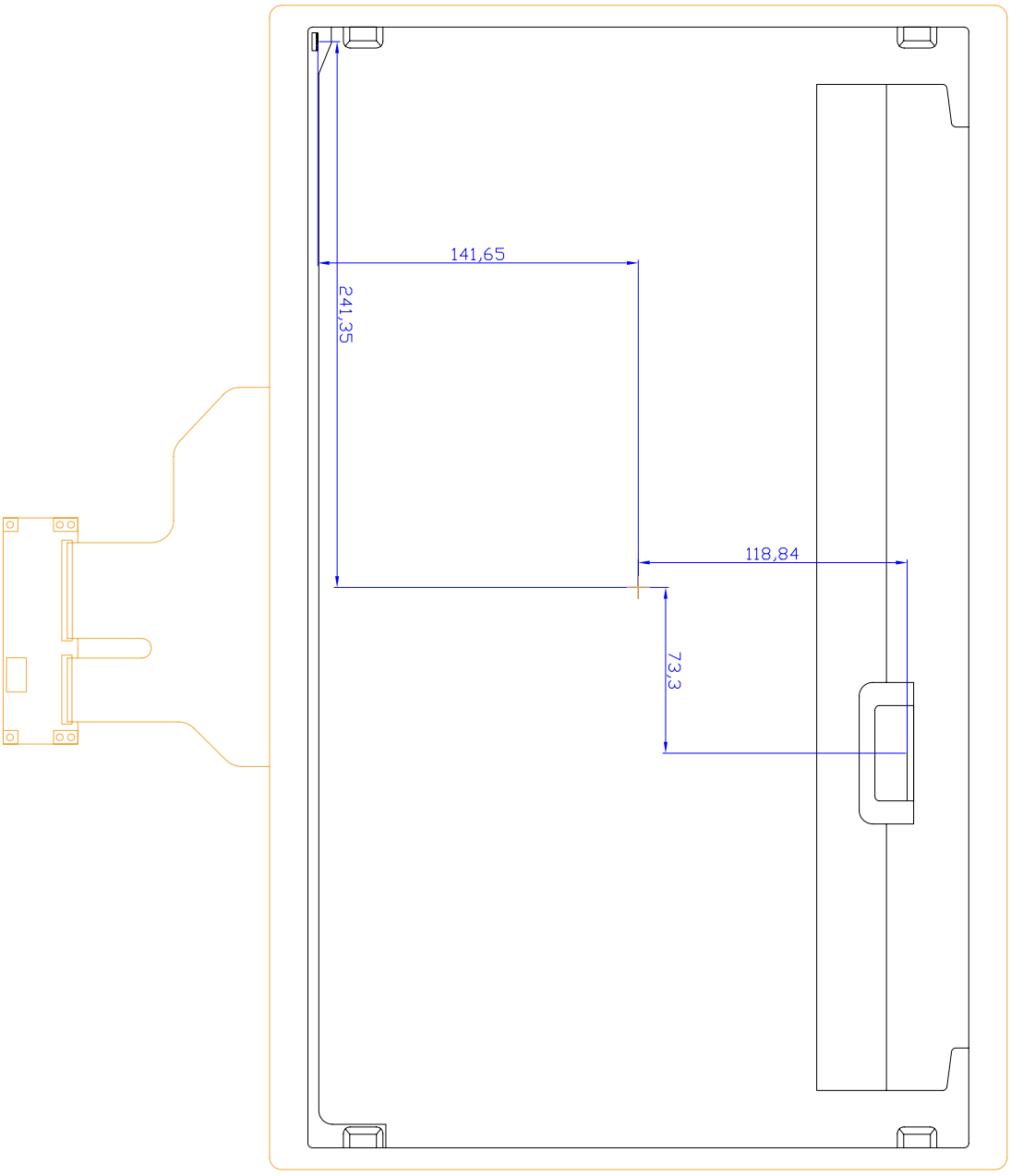
Outline Dimension	Horizontal	495.6 mm
	Vertical	292.2 mm
	Depth	10.6 mm
Bezel Area	Horizontal	271.31 mm
	Vertical	479.84 mm
Active Display Area	Horizontal	268.11 mm
	Vertical	476.64 mm
Weight	2748 g (Typ.)	
Surface Treatment	Hardness:3H	

Note: Please refer to a mechanic drawing in terms of tolerance at the next page.

Front View


M3 User Hole,DP=3.5mm(x4)
256
128
8.6
6
6
10.6
326.11(Touch Outline)
292.2(Outline)
271.31(Bezel Open)
268.11(Active Area)
16.96
10.45
12.05
9.65
188.2
117,74
Ø3.6
100
3
3
3
33
3
514.9(Touch Outline)
495.6(Outline)
479.84(Bezel Open)
476.64(Active Area)
9.65
16,96
9.48
7.88
8.6
6
6
118
236
14.4(ALL)
2.7(TP)
1.1(TAPE)
10.6(LCD)

Rear View



11. Touch Specifications

Product Applicable

This specification is applied to the Projected Capacitive EXC series.

Structure

For Dimensional and structural information, refer to the attached drawing.

Environmental Specifications

Specification	Value
Operating Temperature	0°C to 50°C (no condensation)
Operating Humidity	-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C Less than 133.8g/m^3 (no condensation)
Storage Temperature	-0°C to 60°C (no condensation)
Storage Humidity	-40°C to 60°C Less than 95%RH (no condensation) Exceeding 60°C Less than 142.9g/m^3 (no condensation)
Chemical Resistance (top surface)	Toluene, Trichloroethylene, Acetone, Alcohol, Gasoline, Machine Oil, Ammonia, Glass Cleaner, Mayonnaise, Ketchup, Wine, Salad Oil, Vinegar, Lipstick, etc.

Mechanical Characteristics

Specification	Value	
Operating Life	Input (finger)	50,000,000 hits
Light Transmittance	85% (typical value at full wavelength)	
Surface Hardness	Over 7H (by JIS pencil hardness)	
Electrode Matrix Pitch	Approximately 5-7mm	
Structure	Cover Lens + ITO Glass + FPC + PCBA	
Controller	EXC3188	
User connector	Hirose DF11-10DS-2C	

Electrical Characteristics

Specification	Value
Maximum Voltage	DC6V
Recommended touch contact area	>=PHI 10mm

Appearance

Scratch, dust (W = width, L = length, D = average diameter = (longest + shortest) /2)

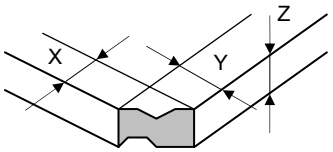
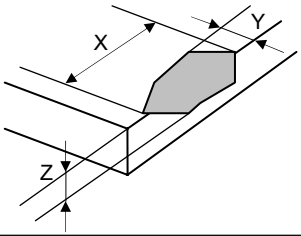
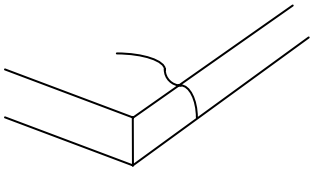
Item	Width (mm)	Length (mm)	Acceptable Numbers	Total
Linear(Scratch/Dust) For scratch/dust over 0.1mm in diameter, refer to the Circular.	0.1≥W>0.05	3≥L	1pc in ϕ30mm	Within 5pcs /panel
	0.05≥W	10≥L	Acceptable	
Circular (Scratch/Dust)	0.5≥D>0.2		1ps in viewing area	
	0.2≥D		Acceptable	

Applied only in the Viewing Area. Scratches or dusts in the outside of the Viewing Area are acceptable unless the electrical characteristics are affected.

Dirt

Acceptable if not noticeable on a black mat.

Chip, crack (t = glass thickness) (applicable only for the glass)

Item	Size (mm)			Acceptable Numbers
Corner		X	≤3	2pcs /panel
		Y	≤3	
		Z	≤t	
Side		X	≤5	2pcs /side
		Y	≤3	
		Z	≤t	
Crack				Not acceptable

11-1 Testing Conditions

Testing Conditions

If the condition is not specified, t he test is performed under the supplier's standard testing condition.

Tests are performed under the room temperature unless specified. The room temperature is regarded as follows:

Temperature: 20°C±5°C
Humidity: 65%±10%RH

Environmental Specifications

Chemical Resistance Test

Condition: Tested after leaving the chemical on the surface for 12 hours then wiping it off by cloth.

Judgement: Must be no effect in appearance.

Mechanical Characteristics

Operating Life Test

Condition: Testing rod: Refer to Figure 1
Load: 3N
Cycle: 2 hits/sec

Judgement: Must operate properly after the test

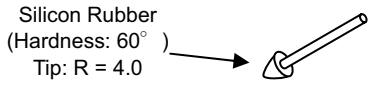


Figure 1. Testing rod 1

Appearance

Appearance Test

Condition: Tested by an examiner with over 1.0 eyesight at 30cm away from the product under the transmittable light at angle of over 60° to surface of the product.

Judgement: Must satisfy the specification.

11-2 Reliability Condition

Temperature Condition

Temperature Condition Test

Following test are performed in the condition with no dew condensation:

Cold Test: Tested after leaving the parts in -40°C±3°C for 240 hours and in the room temperature for 2 hours.

Heat Test: Tested after leaving the parts in 75°C±3°C for 240 hours and in the room temperature for 2 hours.

Humidity Test: Tested after leaving the parts in the temperature 60°C±3°C, humidity 90 to 95% for 240 hours and in the room temperature for 2 hours.

Cycle Test: Tested after 5 cycles of leaving the parts in the temperature -30°C±3°C for 1 hour and in the room temperature for 0.5 hours, then leaving the parts in the temperature 70°C±3°C for 1 hour and in the room temperature for 0.5 hours.

Judgement: Must satisfy the following:

Function : Operate properly.
Appearance: Must satisfy the specification.

11-3 Handling Notes

Precautions

This product is intended for use in standard applic ations (computers, office automation, and other office equipment, industrial, communications, and measurement equipment, personal and household devices, etc.) Please avoid using this product for special applications where failure or abnormal operation may directly affect human lives, or cause physical injury or property damage, or where extremely high levels of reliability are required (such as aerospace systems, vehicle operating control, atomic energy controls, medical devices for life support, etc.).

Handling Notes

Do not press or scratch the product with any object with a sharp edge or end.

Do not forcibly bend or fold the product.

When the product is stored, make sure it is packed in a packing box and stored in a storage temperature range, eliminating any outside load.

Do not use or store the product under a condition where the product will be exposed to water, organic solution or acid.

Do not use the product under the direct sunlight if a film material is used on it.

Do not disassemble the product.

When you handle the product, hold the product by its body. Do not hold by the tail.

Clean the product with a soft cloth or a soft clot h with neutral detergent or alcohol. When contaminated with chemicals, wipe them off immediately with caution not to cause injury to human body.

The edge of the glass is not rounded and may cause injury.

Construction Notes

The environmental specifications, mechanical characteristics, and electrical characteristics are only applied to the Active Area.

Do not use the touchscreen when the condensationoccurs. The condensation inside of the touchscreen is a natural phenomenon and should disappear after the touchscreen is warmed up.

Electrical & Software Notice

Projected Capacitive Touchscreen was designed to work with our controller board.

If the driver software is to be developed by the customer, please study the characteristics of touch screen and controller before development.

Mounting Notes

Projected capacitive touchscreen detects the touched locations by measuring the increased amount of the capacitance value between its electrodes at inputs. Once it is built into a system, capacitance couplings are continually yielded among the touchscreen, FPC tail, controller board and metal Chassis. When turned on, our projected capacitive touchscreen will automatically adjust its sensitivity level to the surrounding environment at the standby state in order to avoid the affects by the surrounding capacitance couplings. If surrounding environment changes or materials to alter the electrical field (a large capacitor, power-supply unit, LCD panel, or materials with high dielectric constant) is near, these external factors will adversely affect the function of the touch screen to detect the correct input positions.

At structure design, please refer to the mounting notes below and ensure enough gap distances among each component in order to avoid the external factors described above.

Mounting

Fix the touchscreen firmly so that the gap distances between the touchscreen and other components will not be affected by touching or will not change with the passage of time. An unexpected input may be caused if the gap is too narrow.

The locations on which a certain gap distance is required are as follows.

- Between LCD panel and touchscreen: L1
- Between touchscreen and the surface of the bezel: L4
- Between touchscreen and the back of the bezel: L2
- Between tail and LCD panel, tail and metal chassis : L3 & L5 (an insulating tape can be used)

In case of using capacitive sensor outside, the moisture may cause the trouble.

Mouting Toutchscreen on a display

It is recommended to use an insulating resin material for the bezel. Ensure the gap between the touchscreen and front bezel (L4)

If a metal plate is used for the bezel, unintended capacitance couplings may occur on the periphery of the active area. If a metal material is used for bezel, ensure the gap of approximately 2mm between touchscreen and bezel (L2).

In order to avoid the gap distance L1 from being changed with the passage of time, it is recommended to apply the adhesive tape onto all the 4 sides with no space (fully sealed) when gluing the touch screen.

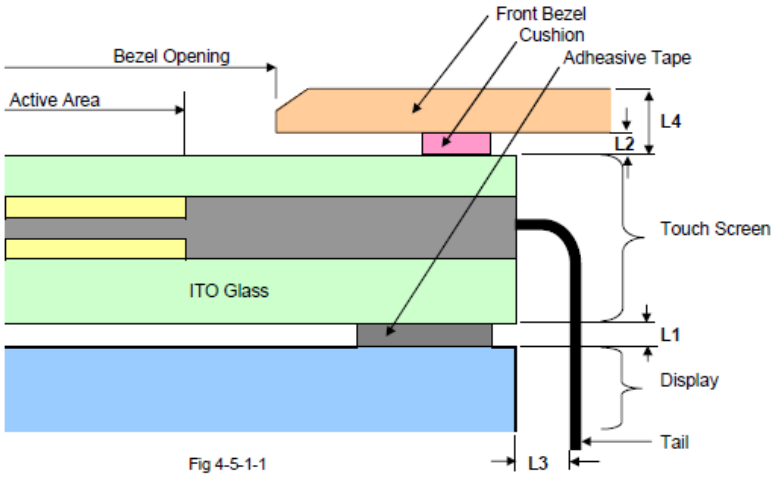


Fig 4-5-1-1

L4=2mm

L2=2mm:Gap between Touchscreen and Bezel if the bezel is made of matal.

L1=1mm:Gap between Touchscreen and LCD panel

L3=1mm:Gap LCD panel and Tail

Tolerance

There is a tolerance of 0.2 to 0.3mm for the dimensions of the touchscreen and tail. A gap must be made in the case and the connector to absorb the tolerance.

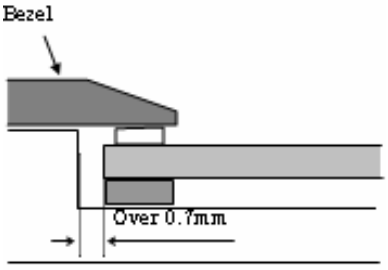


Fig.4-5-2

Tail

The tail must not be forcibly stressed or bent too hard. The conduction in the insulated area and wire breaking may be caused

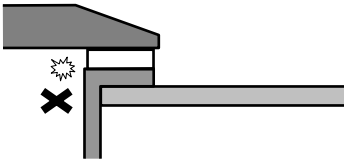


Fig.4-5-3